# SPPH 567: Quantitative Methods for the Assessment & Analysis of Exposure Data

**Time:** Fridays from 09:00-12:00
**Location:** School of Population and Public Health, Room 143


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| **Instructor:** | **Sarah Henderson** |
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**Overview:**

The work of occupational and environmental hygiene professionals requires quantitative competency for collecting useful samples, analyzing data, interpreting the results, and understanding the limitations. This course is designed to give you hands-on experience with these principles so that you feel confident working with data in the field.

**Learning objectives:**

The main goals of this course are for you to learn:

- How to select and conduct analyses of occupational or environmental exposure data
- How to use statistical software and learn new techniques so that you feel comfortable working with the software on your own
- How to design appropriate measurement strategies for various purposes, including monitoring for compliance, epidemiology, and determinants of exposure

The course will use real exposure data sets and challenge you to think for yourself about how to design and conduct both sampling campaigns and analyses of the resulting data. Other objectives for this course are to teach you how to effectively give and receive critical appraisal of your work as you develop your major projects, and to develop your ability to work in teams.

**Course format:**

Subject areas will be introduced with readings from the text or the scientific literature and short lectures. Classes will include discussions of focused questions about the readings and analyses you did that week and will also include consideration of the issues you are dealing with for your assignments.

**Text books:**

- Required: *Statistical Tools for the Comprehensive Practice of Industrial Hygiene and Environmental Health Sciences* by David L. Johnson
- Recommended: *PDQ Statistics* by Geoffrey R. Norman and David L. Streiner

**Software:**

For this course we will be using R and RStudio. Installation is free and will be covered in the first week of class.

**Grading:**

Evaluation for grading purposes will be based on:

- Exposure distributions and limit of detection assignment (15%)
- Exploratory analysis of association between a binary and a continuous variable (5%)
- Analysis and interpretation of the radon data set (20%)
- Midterm exam (20%)
- Mock academic manuscript on a new dataset (15%)
- Sampling strategy group project (20%) and presentation (5%)

The grade will reflect your:

- Understanding of the course material
- Ability to consider and critically evaluate ideas presented
- Clarity of written and oral communication
- Development of effective solutions to problems
- Both competence and innovation in data analysis and sampling strategy design

The final average mark for the class will be in the A- range, because that is the typical entering undergraduate average of students in the class.

- A+ (≥ 90%) is only rarely given (i.e., most years, it is not achieved by any student); it requires completion of and excellence in all core elements, evidence of critical thinking and innovation above and beyond expectations, and consistent attention to detail.
- B+ (≥ 76%) or higher is evidence of graduate level work; it requires completion of and competence in all core elements, and evidence of critical thinking.

**Academic Integrity**

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work.

Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences. A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar.

**Course schedule:**

| Date | Activities |
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| **No Class January 9: Cascadia Conference in Abbotsford** | |
| **Week #1**<br>Jan 17 | - Introductions<br>- Variable types<br>- Frequency distributions<br>- Radon data<br>- Statistical software |
| **Week #2**<br>Jan 24 | - Normal distributions<br>- Lognormal distributions<br>- Goodness of fit test, p-values<br>- Limits of detection |
| **Week #3**<br>Jan 31 | - **Assignment #1 due at beginning of class (15%)**<br>- Missing data<br>- Descriptive statistics for dichotomous variables<br>- Evaluating associations between dichotomous and continuous variables<br>- Simple linear regression with a continuous dependent variable and a dichotomous predictor<br>- Standard reporting methods |
| **Week #4**<br>Feb 7 | - **Assignment #2 due at beginning of class (5%)**<br>- Descriptive statistics for categorical variables<br>- Evaluating associations between categorical and continuous variables<br>- Simple linear regression with a continuous dependent variable and a categorical predictor<br>- Standard reporting methods |
| **Week #5**<br>Feb 14 | - Descriptive statistics for continuous variables<br>- Evaluating associations between two continuous variables<br>- Standard reporting methods<br>- Introduction to simple regression with a continuous dependent variable<br>- Introduction to multiple linear regression |
| **Reading Break: February 17 – February 21** | |
| **Week #6**<br>Feb 28 | - **Assignment #3 due at beginning of class (15%)**<br>- Introduction of logistic regression with a binary variable<br>- Review of multiple regression with a continuous dependent variable<br>- Variable selection, p-values, confounding, interaction, and prediction<br>- In-class discussion and preparation for midterm |
| **Week #7**<br>Mar 6 | - **90-minute in-class midterm exam (20%)**<br>- In-class discussion and preparation for assignment #4 |

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| | - Formation of groups for sampling strategies lectures and projects |
| **Week #8**<br>Mar 8 | - **Assignment #4 due at beginning of class (20%)**<br>- Introduction to sampling strategies<br>- Sampling for compliance<br>- Discussion of homogeneously exposed groups<br>- Brainstorming on a compliance sampling problem and discussion |
| **Week #9**<br>Mar 13 | - Introduction to toxicokinetics<br>- Considerations for the duration of exposure sampling<br>- Discussion of sampling strategy project |
| **Week #10**<br>Mar 20 | - **Sampling strategy project outlines due at beginning of class (no marks)**<br>- Sampling for epidemiology<br>- Brainstorming on an epidemiologic sampling problem<br>- Discussion of the epidemiologic sampling problem<br>- Peer review of sampling strategy project outlines<br>- Discussion of sampling strategy project |
| **Week #11**<br>Mar 27 | - Strategies for determinants of exposure<br>- Brainstorming a determinants of exposure sampling problem<br>- Discussion of a related sampling paper<br>- Introduction to PIMEX<br>- Discussion of sampling strategy project |
| **Week #12**<br>Apr 3 | - **Sampling strategy group presentations (5%)**<br>- Instructor evaluations |
| Apr 14 | - **Sampling strategy group projects due by midnight (20%)** |